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V.S.

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/187,551	11/05/98	MUSAKA K	AM524R1/T289

EXAMINER

IM22/0414

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ART UNIT	PAPER NUMBER
1762	9

DATE MAILED: 04/14/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
09/187,551	Misaka et al
Examiner	**Group Art Unit**
M.L. Padgett	1762

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication .
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

☒ Responsive to communication(s) filed on 12/22/99.

☒ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle,* 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-10 + 27-34 is/are pending in the application.

Of the above claim(s)_____ is/are withdrawn from consideration.

☐ Claim(s)_____ is/are allowed.

☒ Claim(s) 1-10 + 27-34 is/are rejected.

☐ Claim(s)_____ is/are objected to.

☐ Claim(s)_____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The proposed drawing correction, filed on_____ is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on_____ is/are objected to by the Examiner.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 11 9(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number)_____.

☐ received in this national stage application from the International Bureau (PCT Rule 1 7.2(a)).

*Certified copies not received:_____.

Attachment(s)

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 6

☐ Interview Summary, PTO-413

☐ Notice of Reference(s) Cited, PTO-892

☐ Notice of Informal Patent Application, PTO-152

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☒ Other Copy PTO/SB/02A

Office Action Summary

1. In accordance with 37 CFR 1.175(b)(1), a supplemental reissue oath/declaration under 37 CFR 1.175(b)(1) must be received before this reissue application can be allowed.

Claims 1-10 and 27-34 are rejected as being based upon a defective declaration under 35 U.S.C. 251. See 37 CFR 1.175. The nature of the defect is set forth above.

Receipt of an appropriate supplemental oath/declaration under 37 CFR 1.175(b)(1) will overcome this rejection under 35 U.S.C. 251. An example of acceptable language to be used in the supplemental oath/declaration is as follows:

> "Every error in the patent which was corrected in the present reissue application, and is not covered by a prior oath/declaration submitted in this application, arose without any deceptive intention on the part of the applicant."

2. The original patent, or an affidavit or declaration as to loss or inaccessibility of the original patent, must be received before this reissue application can be allowed. See 37 CFR 1.178.

3. The amendment filed 12/22/99 proposes amendments to 27-34 that do not comply with 37 CFR 1.121(b), which sets forth the manner of making amendments in reissue applications. All new amended claim must be totally underlined, and that underlining must always be maintained, because these claims were not in the issued patent. Any language added in a reissue to the patent claims always remains underlined, and anything deleted from the patent claims will always remain in brackets.

4. Claims 27-34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In new claim 27, applicant introduces "a plasma enhanced reaction" three times (lines 6, 8-9 and 11) without either using an article to show antecedent basis after the initial introduction, or using appropriate differentiation, hence causing confusion as to how many plasmas there are, and how closely they are related.

Similarly "a layer" is introduced in line 1, then applicant some times prefaces the term with "the" (lines 6 and 8), and other times uses "a" (lines 8 and 10). Clear antecedence or clear distinction is needed.

5. Claims 27-33 are rejected under 35 U.S.C. 251 as being an improper recapture of broadened claimed subject matter surrendered in the application for the patent upon which the present reissue is based. See *Hester Industries, Inc.* v. *Stein, Inc.*, 142 F.3d 1472, 46 USPQ2d 1641 (Fed. Cir. 1998); *In re Clement,* 131 F.3d 1464, 45 USPQ2d 1161 (Fed. Cir. 1997); *Ball Corp.* v. *United States*, 729 F.2d 1429, 1436, 221 USPQ 289, 295 (Fed. Cir. 1984). A broadening aspect is present in the reissue which was not present in the application for patent. The record of the application for the patent shows that the broadening aspect (in the reissue) relates to subject matter that applicant previously surrendered during the prosecution of the application. Accordingly, the narrow scope of the claims in the patent was not an error within the meaning of 35 U.S.C. 251, and the

broader scope surrendered in the application for the patent cannot be recaptured by the filing of the present reissue application.

In order to make the claims allowable over the prior art in parent application 08/259,584, the specific halogen F, as well as the specific type of fluorine source, CX_4 or CX_3-$(CX_2)_n$-CX_3 were added to the claims, as well as the minimum concentration of F in the deposited silicon oxide. The new claims broaden the scope of the claims to include all types of halogens from any source and do not require a minimum [F]. Furthermore, while the new claims, as exemplified by claims 27, relate the deposition of a layer deposited from gases comprising Si, O and halogen to "a desired stress" or "a tensile stress", this stress and the concentration of fluorine are inherently related, as can be seen in applicant's graphs (Figs 9-13) or in Homma (EPO 517,548 or USPN 5,288,578) in col. 4 of the EPO references, hence removing the concentration and source limitations is recapture. That applicant is stating an effect caused by the [F] previously claimed is like paraphrasing in order to broaden the claims, ie recapture previously excluded limitations.

To restate the issue, controlling the stress is intimately related to controlling the F concentration, hence to claim stress with no clearly defined metes and bounds, or even starting at -1.25 $X10^9$dynes/cm^2 inessence recaptures [F] that were excluded by limitations in the patented claims, as can be easily seen by comparing values in Figures 10 and 13.

Note that claims 34 dependent on 33 contain the limitations of the patented claims that have been deleted from the new independent claims. Claims 28-30 and 32-33 which replace part, but not all the recaptured limitations are insufficient to remove them from this rejection.

6. Claims 27-34 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The added claims still contain new matter. Specification in claim 27, the claim of generic layer deposition, "a tensile stress instead of a compressive stress" and "a process gas comprising silicon, oxygen and said halogen source" are not supported by the original specification. In the patent and specification, note that all depositions are taught to deposit silicon oxide layers and that all inventive processes use TEOS for the Si source, with no generic teachings or use of other gases. In the matter of "intrinsic stress", the only mention of this term is found in the background (col. 3, line 35) when discussing prior art. Col 6, lines 40-45, discuss $1X10^9$ dynes/cm^2 as compressive stress, seemingly contradicting applicant's comments on tensile stress values on p. 5 of the response. When discussing the inventive process, all terms involving stress either have no modifier (Figure 13; col. 4, lines 46-49; and col. 9, lines 28-30) or are "compressive" (col. 6, lines 43-45; col. 8 lines 23-25 and 66-col. 9, line 6). For these reasons, all claims to (non-silicon oxide) generic layer deposition and Si source

material other than TEOS, as well as limitation relating thereto, are New Matter. In applicants response, they cite fig. 13 for showing their comparison of stresses, and discuss which values are which, however the specification does NOT support their allegations as written. If there is some inherent meaning that is not clearly set forth in the original specification, a prior art reference clarifying the issue or a sworn affidavit supplying it and explaining its inherency would be acceptable for cleaning up this issue. Note the claims of tensile stress less than $0.4x10^9$dynes/cm^2, while applicants p. 5 response states at a 600 sccm C_2F_6 flow, the stress becomes tensile stress at about this same value, hence the over all response does not appear to be self consistent.

Claims 27-33 are rejected under 35 U.S.C. 251 as being based upon new matter added to the patent for which reissue is sought. The added material which is not supported by the prior patent is as discussed above.

7. The disclosure is objected to because of the following informalities: Applicant's graph in Fig. 13 and discussion thereof (as well as Fig. 3 to SN 08/691,983 in Novak et al) have negative stress values that appear to be scientifically incorrect. If applicant's have an explanation for this, please supply a prior art reference or other supported means to clarify the issue, otherwise it appears that the values shouldn't be negative, but just down an order to magnitude, otherwise the scales don't make sense, because $0X10^9=0$, giving a discontinuity not properly illustrated by the graph, ie an incredibly broad jump from $0.5x10^9$ to $-0.5x10^9$. So are values really going from $+0.5x10^9$dyne/cm^2 to $-1.25\ x10^9$

dyne/cm^2 (Musaka et al. Fig. 13) or is this an artifact from somebodies attempt to simplify the numbering on the axis? In the other application that appears to have provided the original claim language as previously discussed , the specification, Figures 3 and 4 appear equally erroneous, having positive and negative values all to the power of 10^9 and in dyne/cm^2. The examiner suspects that values that would make more sense are 0 is 0.1, .5 is 0.05, 1.0 is .01, etc., but sees NO enablement for this in the specification. The examiner also wonders if Fig. 9 is accurately labeled (hence is claim 9 correct?), because saying the decreasing the ratio of F in the reactants increases the atomic % F deposited is scientifically questionable. Commonly seen values for internal stress for F-containing SiO_2 deposits, from plasma and other CVD depositions are noted with $2x10^8$dyn/cm^2 (See Homma's 5,288,518; col. 3, line 42-45) being exemplary, and probably related in some fashion to what applicant's values should have been.

Correction is required.

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. Claims 1-10 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 29-33, 38-40 and 42-45 of copending Application No. 08/888,499. Although the conflicting claims are not identical, they are not patentably distinct from each other because of reasons stated in paper No. 4, section 8. Applicant's stated intent to file the terminal disclaimer is noted (p. 4 of 12/22/99 response), and awaited.

10. Claims 27-28 and 30-31 are rejected under 35 U.S.C. 102(b) or (e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Homma (EPO517,548A2 or USPN 5,288,518).

Homma teaches the formation of fluorine-containing silicon oxide films where the internal stress is $2X10^8$dynes/cm^2 (which is less than $4X10^8$) and the dielectric constant is about 3.7. Several methods of deposition are taught including plasma CVD via a parallel plate reactor and reaction gases of O_2, TEOS and FSi $(OCH_2 H_5)_3$, called fluorotriethyloxysilane, but could also be called triethylfluorosiliate, so abbreviation could be FTEOS, FTES or TEFS. Homma uses flow controller, bubblers and nitrogen gas to introduce the reactant gases into the reaction chamber, hence the flow rates are selected and controlled, and for the conditions used, it is seen that the film properties produced are known, ie predetermined. See Figure 3 and col. 4, lines 8-57 in the EPO reference which

is a statutory bar. The US Patent has like teachings, but is the (e) reference. Note the uncertainty over what applicants mean by their stress is the only reason for the 103 aspect of the rejection, and different measurement for different stresses would be expected to show correspondence.

11. Claims 1-10 and 27-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiyama et al.

Nishiyama et al also teaches deposition of silicon oxide containing F, where plasma CVD, including duel frequency or high density plasma, are used (summary, esp. col. 2, lines 30-60 and col. 3, lines 31-56 and 66-col. 4, line 6). Explicit teachings that [F] in the SiO_2 film "can be easily controlled by controlling the flow rate of the source gas" (col. 3, lines 53-56), with example 1 (col. 5-7) teaching reactant gases of TEOS $+O_2+NF_3$ where NF_3 flow rates of 50 sccm, 100 sccm, 150 sccm and 2005ccm produced atomic % of about 2, 3, 4 and 5 respectively (col. 6, lines 36-50). Col. 7, provided alternate F-source teachings of CF_4, $C1F_3$, CiF_4, and $FSi(OC_2H_5)_3$, and discussion of other reactant combinations also showing flow rate dependance for [F] deposited. As dopant concentration of fluorine in the silicon oxide deposit of Homma would have been expected to effect the stress level as discussed above, as well as the dielectric constant which Nishiyama also discusses, it would have been obvious to one of ordinary skill in the art that as flow rate of the F-source has been shown by Nishiyama et al to be related to the amount of fluorine deposited, the controlling and adjusting flow rate in order to maintain

or produce desired film properties dependent on the [F], such as the dielectric constant or the stress, would have been expected to be an effective and efficient way to produce consistent and desired results.

While Nishiyama et al doe shot include CF_3H or other fluorocarbon containing hydrogen in the non-exclusive list of other possible fluorine sources, these compounds are analogous or homologous to the CF_4 explicitly taught, hence would have been obvious to one of ordinary skill in the art as useful alternatives, because they would have been expected to produce the same [F]/stress effects, using routing experimentation to determine their desirable flow parameter, etc. No advantages were found in applicant's specification for using partially hydrogenated fluorocarbons and excluding perfluoronated ones, and all presented measurements used C_2F_6, now excluded from claims 1-10 or 33-34.

It was noted in the reasons for allowance that Nishiyama et al was differentiated over by the allowed claims in PN. 5,571,571, because of the use of different precursor materials, however a closer reading of Example 1 (discussed above) showed that the TEOS $+0_2+NF_3$ reactant gases where explicitly taught to have effective alternatives for the taught and claimed deposition, with CF_4, a once claimed fluorocarbon being specifically suggested as an alternative for NF_3, and various atomic% ranging from 2-5% suggested to be deposited dependent on flow rate. The more general teaching on col. 2, lines 53-54 also suggest NF_3, CF_4 and C_2F_6 alternately as other F-sources, hence it would

have been abundantly obvious to one of ordinary skill in the art to substitute the claimed fluorocarbon compounds for NF_3 in the Nishiyama teaching to produce films by processes as claimed. Also note in col. 6, lines 12-25 of example 1, Al wiring, ie spaced conductive lines, were formed on the substrate prior to the claimed and taught deposition. Any useful line width would have been expected to be used.

Nishiyama et al's example 6 teaches dual frequency plasma deposition with frequencies as claimed, but a different set of reactant gases ($FSi(0C_2H_5)_3+0_2$), however in example 1 on col. 7, lines 22-34, these gases we explicitly taught as possible alternatives to the TEOS+NF_3 combination, hence are of ordinary skill in the art would have expected the alternative duel frequency plasma apparatus to be effective with any of the taught gas combinations, hence obvious to use therewith.

Note example 1, gives TEOS flow rates as 50 sccm and NF_3 as 0-500 sccm, depending on layer and trial. As NF_3 has three F, 50 sccm to 0-500 sccm gives 1:(0-30) ratio of Si:F which is inclusive of 14:1, although from Nishiyama et al's teaching one would expect greater amounts of F to produce larger atom% F in the deposit, while applicant's Fig. 9 appears to be saying just the opposite, ie that as the ratio of Si to F increases (ie. less F present in reactants with respect to Si) that atomic% F actually goes in the opposite direction (increases), but it is questionable whether this was actually what was meant, since decreasing the fluorine source does not usually increase the amount of it

deposited unless some other parameters is significantly changed. (See comment in section 7).

12. Claims 27-34 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 29-33, 38-40 and 42-45 of copending Application No. 08/888,499 in view of Nishiyama et al, for reasons as stated in the previous action.

This is a provisional obviousness-type double patenting rejection.

13. Claims 27-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over the PCT reference WO 92/20888 to Weise.

Weise teaches the use of halogen etchants, such as CF_4,C_2F_6, SiF_4, etc (p. 9 and 15) to reduce the defects and amount of hydrogen present as hydroxyl in silicon oxide films deposited by methods inclusive of PECVD (p. 10, 11, 12), using organo silicons such as TEOS (p. 9 and 13), where the intrinsic stress of the deposit is thereby reduced from what it otherwise would have been. This process is controlled by adjusting the ratios of the gases introduced (p. 10 an 15). As the etchant (halogen gas) is taught to directly effect the intrinsic stress, choice of reactant ratio as taught is equivalent to predetermining the stress level due to the inter relationship. While Weise does not discuss selecting the rate at which the etchant/halogen source is introduce, the parameters of flow rate and reactant ratio are inherently related, such that it would have been obvious to one of ordinary skill in the art that in order to control the ratio of reactant one must select, ie

control their flow. Neither are H-containing fluorocarbons taught, but the obviousness of that difference discussed above in section 11, applies equally here.

14. Applicant's arguments filed 12/22/99 and discussed above have been fully considered but they are not persuasive.

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Any inquiry concerning this communication should be directed to M. L. Padgett at telephone number (703) 308-2336 and FAX (703) 305-3599 (after final official); and 305-6357 (unofficial).

MARIANNE PADGETT
PRIMARY EXAMINER
GROUP 1700

Padgett/mm

March 27, 2000

April 07, 2000

April 11, 2000